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Evaluation of an innovative, evidence-guided, PBL approach.

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SUMMARY

Aim: To understand the experiences of students and problem-based learning (PBL) facilitators during an evidence-based curriculum change to a PBL programme within an undergraduate medical course in South West England.

Methods: Four novel PBL cases were designed and implemented, based on educational theory and evidence. Eight focus groups were undertaken with Year-1 and -2 students (n = 18) and PBL facilitators (n = 14) to explore the experiences of participants. Thematic analysis and conceptual abstraction led to insights into the intended and unintended consequences of the change.

Results: Participant responses to the change process were influenced by the perceived relevance and value of the change (e.g. benefit to student learning), which was shaped by individual beliefs and preferences (e.g. presumed purpose of PBL, relative value placed on different curriculum topics, and desire for uniform educational experience), and the wider education context (e.g. expectations of assessment). It appears that the three distinct elements must align for the changes to be received positively.

Discussion: This study describes how we updated our PBL curriculum in response to new evidence, and demonstrates the importance of communicating the pedagogic rationale behind changes, and meticulous planning, preparation and alignment, even in distant parts of the curriculum. Engaging with existing views and attitudes is an essential requirement for successful curriculum change.

Introduction

Problem-based learning (PBL) is an educational strategy that recognises that students are more motivated by working with patients and solving problems than by conventional approaches to teaching.[1] In recent years other techniques such as team-based and case-based learning have become popular. As these cost less to deliver, here is pressure to demonstrate that PBL is delivered in the most effective way and continues to bring strong educational benefits. Measuring the outcomes of PBL is challenging, as it is implemented differently in different settings, and changes to PBL

usually sit within wider curriculum change.[2] As PBL is a complex intervention, evaluations of outcomes should use methodologies that make 'a deliberate attempt to capture all possible variables rather than randomize them away'[3]. We undertook a scoping review of the relevant literature, with 'Problem Based Learning' and 'medical education' as our initial search term using PRIMO and Google Scholar databases. We identified four themes (Box 1), related to authenticity,[4] patientcentredness,[5] transfer[6] and the broader roles of doctors,[7] that we felt could improve the education outcomes of PBL whilst retaining its fundamental principles and recognised benefits.[2] We updated four cases to reflect these themes.

The aim of this study was to understand the responses of students and PBL facilitators to this change process.

Box 1: Updating PBL cases: themes identified from literature search

- Promoting authenticity: Using more realistic and authentic narratives and resources e.g. use of multimedia and real patients[1,2].
- Increasing patient-centredness: Promoting people as 'individuals' rather than diseases[3].
- Designing for transfer of knowledge: Increasing students' ability to adapt and apply their learning to new and different situations[4].
- Reflecting broader doctor roles: Cases where psychosocial, quality improvement and population health are foregrounded[5]

Methodology

Focus groups were chosen to enable us to understand the diverse views of participants and to reveal complexities, subtleties and tensions.[8]

The study took place in years 1 and 2 and across two sites of an undergraduate programme in South West England where PBL provided 20 percent of contact time and formed the hub of learning, alongside aligned lectures, workshops, clinical skills training and clinical placements. PBL groups of 8-10 students study a scenario over two weeks in three 2 hour sessions using a modified Maastricht 7-step approach[9]. PBL scenarios were generally doctor–patient interactions, constructed to stimulate learning round a set of broad concepts related to biomedical sciences, psychosocial sciences, population health, clinical skills and professionalism. Students determined learning

outcomes for each case, guided by the facilitators. Year-1 facilitators held PhDs and Year-2 facilitators were clinicians. Students and facilitators received regular training in our PBL philosophy and process. The assessment of students considered integrated medical knowledge, research-like skills, clinical skills and professionalism gained across the curriculum, with a philosophy of 'frequent look, rapid remediation'.

In 2012, four scenarios (two of 10 in Year 1 and two of 12 in Year 2) were updated to address the four educational themes (Table 1). Although the emphasis of each case shifted, the core learning outcomes remained the same. PBL facilitators attended face-to-face training events and received written guidance and a podcast to enable them to support students around these new cases.

All Year-1 and -2 students (n = 427) and facilitators (n = 47, excluding the research team) were invited to participate in focus groups via e-mail and face-to-face reminders. Students and university-employed PBL facilitators were not paid for participating. NHS-employed facilitators were reimbursed for their time. All volunteers were accepted as participants. Data were collected in May and June 2012, 2–3 months after the first two pilot cases and immediately after the other two pilot cases (Table 1).

Focus groups were facilitated by a researcher not involved in teaching or assessment (HL). Participants were asked about their experiences and opinions towards PBL and the wider programme (Box 2).

Box 2. Focus group prompts

- What was your general response to this PBL scenario?
- What did you notice was different about this case?
- How did it integrate with your other learning?
- Did it change the way you think about a doctor's role?

Detailed notes were taken in all focus groups and audio recording was used in seven of the eight focus groups (the audio equipment failed for one group). Audio recordings were transcribed. Three team members analysed four transcripts independently, noting strong views, issues and themes, before agreeing a thematic index and descriptors that were then applied to the full data set. This involved some expanding and collapsing of themes and the refinement of descriptors.[8]

Ethical approval was granted by the research and ethics committees of the participating universities.

Results

Eighteen students (nine male and nine female) took part in four student focus groups ranging between one and nine participants). Fourteen PBL facilitators (four male and 10 female) participated in faculty focus groups (ranging between one and seven participants). Four themes were identified in the data, each with several sub themes (Table 2).

Theme 1: responses to the updated PBL cases

The parallel and 'what if?' cases (Appendix S1) helped students to make connections between concepts and transfer their learning to new problems (Table 2, quotes 1, 2 and 3). Scenarios incorporating authentic clinical materials motivated students and helped them to 'think and feel' like a doctor (Table 2, quotes 4 and 5). The scenarios promoted different degrees of patient-centredness (Table 2, 1.3). 'Maria' (Year-1 scenario, Appendix S2), with an audio clip and authentic test results (Table S1), was frequently referred to by name in the focus groups, and students seemed to appreciate the social and cultural aspects of the case (Table 2, quote 6). 'Diane' (Year-2 scenario), however, was referred to by disease (Table 2, quote 7). Learning through meeting real patient(s) was often described as highly memorable, but some students reported finding it hard to learn about biomedical sciences from patients (Table 2,quotes 8 and 9). The case that focused on audit and quality improvement had a more mixed response. Students' reservations appeared to be closely associated with beliefs about the purpose of PBL learning and their perceptions that assessment was weighted towards the biomedical sciences (Table 2, themes 2 and 3).Some, however, appreciated the importance of cases reflecting broader roles of doctors (Table 2, quotes 10 and 11).

Theme 2: experience of change

Changing the format of cases also led to uncertainty, although if facilitated well the ariation was often welcomed (Table 2, quote 14). Students' views were not static (Table 2, quote 15), and were often explicitly related to how their facilitator viewed or engaged with the changes, and vice versa (Table 2, quotes 3 and 20).

Theme 3: individual beliefs about the purpose of PBL learning

The data revealed varied views about the purpose of PBL. Some saw PBL as a means

of integration (Table 2, quotes 16 and17), whereas others felt that disciplines should be learned in ‘compartments’ and separated into different teaching activities (Table 2, quote 18). Some participants felt that biomedical sciences should be prioritised over social and population aspects of medicine in the early stages of medical education (Table 2, 3.2). Furthermore, if a participant saw the purpose of PBL was to learn biomedical science (Table 2, quotes 19 and 20) there was a dissonance when a case focused on understanding patient experience or a quality improvement project.

Theme 4: the impact of education context, logistics and communication

The wider context of the programme, particularly assessment, affected the student responses to PBL changes. Some students wanted to steer PBL towards topics that they felt were needed in their exams, especially in Year 1 (Table 2, quotes 21 and 22). An unexpectedly strong subtheme was uniformity and fairness (Table 2, quotes 23 and 24). Many students felt that every group should have the same, uniform experience in terms of content, quality of delivery and practical details, such as facilities, IT and the opportunity to meet a patient. This was driven partly by a desire for a ‘level-playing field’ in the preparation for assessment.

Discussion

The use of educational evidence created a strong rationale for the direction of change and probably contributed to the positive responses to the pilot cases. This may seem obvious, but in our experience many innovations originate from ‘good ideas’ rather than from literature. The cases that focused upon patient-centredness, and the broader roles of doctors, prompted the greatest diversity of views, strongly influenced by whether the change was perceived to align with the purpose of PBL. Educational beliefs and disciplinary viewpoints are known to be critical factors for curricular change.[10] Participants in our study tended to prioritise the biomedical sciences above other subject areas, and held strong views about PBL being a ‘fair and uniform’ experience. We recognised that training and communication of the pedagogical rationale for change would be key to the success of the innovation. This study highlights that a critical element of this training is engaging with the existing views and attitudes of participants. Although some views and attitudes can be particularly resistant to change,[7] we found many were fluid. The perception that students found it difficult to learn biomedical science from real patients was unanticipated. PBL facilitators play a vital role in scaffolding students’ learning and supporting them to manage complexity.[11] They could also play an important role in modelling how to apply the PBL process to patient encounters. This study highlighted the importance of

meticulous planning, preparation and communication when implementing curriculum change, even in parts of the curriculum that were distant from PBL. Alignment with the assessment processes is crucial, yet assessment is often held under tight governance, sometimes beyond the remit of change leaders. One limitation is that the study was undertaken in a single medical school, albeit across two sites. The rich description of the context of our study will mitigate this concern to some degree. A strength of the study is the multidisciplinary participants and research team (clinicians, biomedical and social scientists, and students). The study itself does not tell us whether student learning changed as a result of the intervention, although there was no observed difference in students' scores from integrated medical knowledge examinations. Many of the study findings are relevant to educationalists implementing curriculum innovation, as well as those directly involved in PBL. Key messages include recognising how communication, planning and alignment with curriculum areas outside the area of review, and engaging with the views and attitudes of students and facilitators, are essential requirements for successful curriculum change. We have retained these four new cases, and the remaining 18 PBL cases have been updated to reflect one or more of the educational themes. Feedback during training sessions suggests that these changes are now broadly accepted. Finally, the study provides evidence to support our premise that updating PBL cases in line with current theory and evidence can bring added value and provide a strong foundation for success.

Table 1. The four pilot problem-based learning (PBL) cases, which were updated to promote the transfer of learning, authenticity to clinical practice, patient-centredness and broader roles of doctors

Core concepts	Original PBL scenario	New case	Aim of changes: to emphasise
Cardiovascular structure and function; homeostasis; hypertension and its management; consequences of poor control, Evidence-Based Medicine, adherence.	A GP–patient interaction where a patient is opportunistically found to have hypertension. The patient struggles with drug adherence.	A quality improvement project in a GP surgery aimed at identifying and managing patients with hypertension in order to prevent future cardiovascular events.	**The broader roles of doctors:** population health and quality improvement were foregrounded in the case. **Patient-centredness:** patient perspective around being diagnosed with hypertension and adhering to treatment regimens was included through online videos and audio recordings.
Renal structure and function; urinary tract infection (UTI), incontinence, antibiotics; ageing; embarrassment; access to health care, interpretation of laboratory reports.	A GP–patient interaction where an elderly Chinese man has dysuria, frequency and incontinence. Urinalysis and other laboratory test results indicate a UTI, for which he is treated. Further tests reveal that his Prostrate Specific Antigen is raised and his prostate enlarged.	'Maria', an elderly Polish woman attends the Emergency Department with confusion and urinary incontinence. She is found to have a UTI and low glomerular filtration rate.	**Authenticity**: an audio recording of a Foundation Year 2 doctor discussing how she made decisions about a similar patient's care was included. Students were required to request diagnostic tests, prior to them being provided for interpretation. **Transfer of learning:** short 'what if?' scenarios were included where students were required to apply core concepts to different clinical and social contexts e.g. 'what if the patient was a man and not a woman?'
Genital tract structure and function; post-coital bleeding, cervical cancer; risk factors and treatment; psychological effects of cancer diagnosis; screening; performing intimate procedures	A GP–patient interaction where Dianne, a 38-year-old woman, presents with post-coital bleeding, having missed a smear test that previously found Cervical Interepithelial Neoplasia III. She is referred urgently to the hospital's gynaecology department where cervical cancer is found and treated with hysterectomy.	The same patient case 'Dianne' is used.	**Transfer of learning:** Short parallel cases were incorporated into the third PBL session, requiring students to apply core concepts of the case to different scenarios, e.g. cervical cancer in South Africa; post-coital bleeding in different aged patients; screening for breast cancer. **Authenticity:** Patient videos to highlight issues faced by similar real patients.
Structure and function of sensory and motor organs in health and degeneration; multiple morbidity; ageing, living alone; illness and isolation; multi-agency approaches to elderly health care; ethics/ capacity.	A GP–patient interaction where an elderly man with osteoarthritis and depression develops polymyalgia rheumatic and Parkinson's disease. He is worried about developing Alzheimer's. His conditions slowly deteriorate despite drug treatment.	No scenario was provided. The students were required to interview a patient with at least one degenerative condition (e.g. Parkinson's, osteoarthritis, dementia) on their clinical GP placements and apply the PBL step process to their own case.	**Authenticity:** students apply the PBL process to real patients. **Patient-centredness:** Students were guided to enquire about the impact that the patient's condition has on their lives. **Transfer of learning:** Students shared their cases within group and identified similarities, differences and common issues.

The core concepts of the cases remained the same.

GP = General Practice

Table 2. Themes and subthemes identified in the transcripts derived from eight focus groups with medical students and problem-based learning (PBL) facilitators across two sites and year groups

Theme	Subtheme	Quotes
1. Responses to the updated cases	1.1 Transfer of knowledge	1 …those 'What if?' questions really helped to transfer. **Year-1 facilitator** 2 Once we looked at the new cases I saw a question and said 'oh that's a new application of knowledge'. **Year-1 student** 3 I loved the fact that you had, that they had the key points here, what if Mrs Kowalska was a man? Brilliant, brilliant, and the students loved these by the way. **Year-1 Facilitator**
	1.2 Authenticity: 'real problem solving'	4 It [the test results] just gave it some sort of, a bit more relevance, felt a bit more medical, and I think almost made the students feel that, you know, they were dealing with a clinical, medical problem. **Year-1 facilitator** 5 You actually place yourself in that situation and you ask yourself those questions, and then it's much more real. **Year-1 student**
	1.3 Patient-centredness: 'Patients as individuals'	6 …they went into the sociodemographic factors of health, the human aspect [Maria], and they were pretty keen to grab onto those. **Year-1 facilitator** 7 The trigger case, is kind of, it's almost left in the first session, so we go through it and we read about Diane for example and her, you know her experience of health care system and all that kind of stuff, and then we just leave her. And then in the second and third sessions it's very much about the science…we completely forget about the patient. **Year-2 student** 8 You can't get it out of a book…when you're actually talking to a patient about it, it's a completely different level. **Year-2 student** 9 We all just sat down slightly headless and talked about our patients and the effects of his lifestyle, and the biomedical and clinical perspectives kind of just got lost. **Year-2 student**
	1.4 Broader roles of doctors	10 I'm obviously not as experienced as the people possibly setting this and knowing what the actual roles are in health care and a doctor; one of those roles will be to audit our work, one of those roles will be to have that clinical audit loop and it being able to evaluate, so from that point of view it did make you think. **Year-1 student** 11 We probably do need more direction, like steering towards public health because people will ignore those questions. **Year-1 student**
2. Experience of change		12 I just remember this awkward silence where we had no idea of what we were supposed to do with it, and I think that actually prompted our facilitator to say, ok let me show you where this is going to go. **Year-2 student** 13 It's one of those things that always needs to keep improving and keep um kind of catching our attention, and keeping us in the sessions. **Year-2 student** 14 I thought it was a different change and it's quite refreshing to get the five different cases, and to be honest I felt like I learned more. **Year-1 student** 15 Dreadful…everyone just completely slated it and there was not one real positive thing to say…[but later conceded] If we did some of the things that we've discussed…then I think it would be far better than any other PBL case. **Year-1 student**
3. Individual beliefs about the purpose of PBL	3.1 Integration versus compartmentalisation	16 I think I probably got the most out of that case unit in terms of not just biomedical, but other stuff as well, I feel it was a much more well-rounded knowledge that we gained. **Year-1 student** 17 My understanding of PBL is the centre, it brings it together. **Year-1 facilitator**
	3.2 Views on different disciplines	18 The PBL kind of model was meant to do all the kind of bioscience…yeah pharmacology and all that….It [the new scenario] was just a lot of ethical things, and I thought how the patient felt and that's really important but we can do that in Jigsaw [another teaching session]. **Year-2 student** 19 …everybody is very, wants to go into the science, the basic science and the pharmacology. **Year-2 student** 20 I actually pushed mine into looking at the biomedical…but that's what I'm interested in. **Year-1 Facilitator**

Table 2. (continued)

Theme	Subtheme	Quotes
4. Impact of the wider education context	4.1 Assessment	21 They wanted to concentrate more on the basic sciences and anatomy because that's what [they perceive] their end of year exam covers. **Year-1 facilitator** 22 It bangs up against their anxiety because…in other medical schools they have 2 years straight of science learning before they can even go onto the wards. **Year-1 facilitator**
	4.2 Uniformity and fairness in PBL	23 PBL is very facilitator-dependent, and it can be quite frustrating where not everybody gets the same experience out of various aspects of this course, just down to who is leading their session, so I'd actually prefer it if it was more uniform I think, everyone could then have the same experience. **Year-2 student** 24 If the facilitators were kind of trained to make sure that they emphasise the same things in the same ways. **Year-1 student**

References

1. Barrows HS. Problem-based learning in medicine and beyond: a brief overview. New Directions for Teaching and Learning 1996;68:3–12.
2. Zahid MA, Varghese R, Mohammed AM, Ayed AK. Comparison of the problem based learning-driven with the traditional didactic-lecture-based curricula. Int J Med Educ 2016;7:181–187.
3. Norman GR, Schmidt HG. Effectiveness of problem-based learning curricula: theory, practice and paper darts. Med Educ 2000;34(9):721–728.
4. Dammers J, Spencer J, Thomas M. Using real patients in problem-based learning: students' comments on the value of using real, as opposed to paper cases, in a problem-based learning module in general practice. Med Educ 2001;35(1):27–34.
5. Schell R, Kaufman D. Designing PBL case studies for patient-centered care. International Journal of Learning, Teaching and Educational Research 2015;13:160–180.
6. Hung W. Problem-Based Learning: A Learning Environment for Enhancing Learning Transfer. New directions for adult and continuing education. 2013;137:27–38.
7. Hoover CR, Wong CC, Azzam A. From primary care to public health:using problem-based learning and the ecological model to teach public health to first year medical students. J Community Health 2012;37:647–652.
8. Robson C, McCartan C. Real world Research. Chichester: John Wiley & Sons; 201622 It bangs up against their anxiety because…in other medical schools they have

9. Schmidt HG. Problem-based learning: rationale and description. Med Educ 1983;17(1):11–16.
10. Lane I. Change in higher education: understanding and responding to individual and organizational resistance. J Vet Med Educ 2007;34:85–92.
11. Chung E, Yew EH, Schmidt HG. To what extent do tutor-related behaviours influence student learning in PBL? Adv Health Sci Educ Theory Pract 2015;20:5–21.
12. Persson AC, Fyrenius A, Bergdahl B. Perspectives on using multimedia scenarios in a PBL medical curriculum. Med Teach 2010;32:766–772.

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